ABSTRACT OF THE DISCLOSURE

This invention relates to computing numerical solutions of linear systems of equations, specifically to implementing preconditioning of the coefficient matrix of such a system. The preconditioning applies to any coefficient matrix, dense or sparse, based on the solutions of a physical problem of unknown functions, commonly referred to as basis or interpolation functions, where the basis function spans more then one mesh element. Examples of such linear systems can result from, as examples, an electromagnetic analysis of printed circuit boards or field scattering in radar applications, fluid mechanics and acoustics. A method and system to compute a preconditioner for a coefficient matrix A that is compatible with the linear system of equations that provides basis function support over at least two mesh elements. Coupling of the preconditioner between partitions of a portioned mesh representation is only through basis functions at the partition boundaries.